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REVIEW OF FLORIDA CHAMIDAE

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“The existing literature on the shells of Chamidae is so confused that a thorough investigation from a critical point of view is necessary in order to solve the problems and lead towards a satisfactory knowledge of the matter.”—*Odhner*.

This inquiry began on the Atlantic beach at Boynton, Palm Beach County, where large chamias are rather abundant on ledges of coquina rock in about 3 to 10 feet of water. As usually happens, the shells and the books essential for their determination were not available in the same place, so that the consultation of literature became the senior author's task in Philadelphia, while the junior author continued to supplement the material with specimens and observations bearing on the matter.

The chief difficulties are (1) the perplexing literature, redundant with badly described “species.” Nils Hj. Odhner's “Studies on the morphology, the taxonomy and the relations of recent Chamidae” (in *Kungl. Svenska Vetenskapsakad. Handlingar*, vol. 59, 1919), is a bright spot on a dark road. (2) The second difficulty is the remarkable transformations these shells undergo in response to varying ecologic conditions. On open shores exposed to surf, only those young which attach to a heavy or immovable substratum survive. They acquire a broad base of attachment, nearly as extensive as the shell, which is erect only along the upper margin, the whole being somewhat triangular in section. In such exposed places the sculpture proper to the species is greatly reduced and blunted, usually covered with a coat of algae, but sometimes clean, as in *C. congregata* on Pinnas at Sanibal Island, though even here foliations are repressed. In some places, such as Harrington Sound, Bermuda, where there is not much wave action, the attachment may be wholly lost in adults, but lime-depositing algae and other organisms coat the shell with a very thick dense layer, impossible to remove, as in

Chama sinuosa bermudensis Heilprin. Where the conditions permit attachment to small objects, dead shells, bits of coral and the like, the attachment may remain small, the attached valve being convex and often as profusely sculptured as the free valve, the characteristic sculpture being fully developed. In some cases it is not possible off-hand to tell whether the characteristics of a lot are wholly due to their ecologic setting, or may mean racial divergence; and it is sometimes convenient to have a name for such forms until their status can be fully exposed. We have therefore admitted such names as *variegata* Rve. and *firma* P. & M.

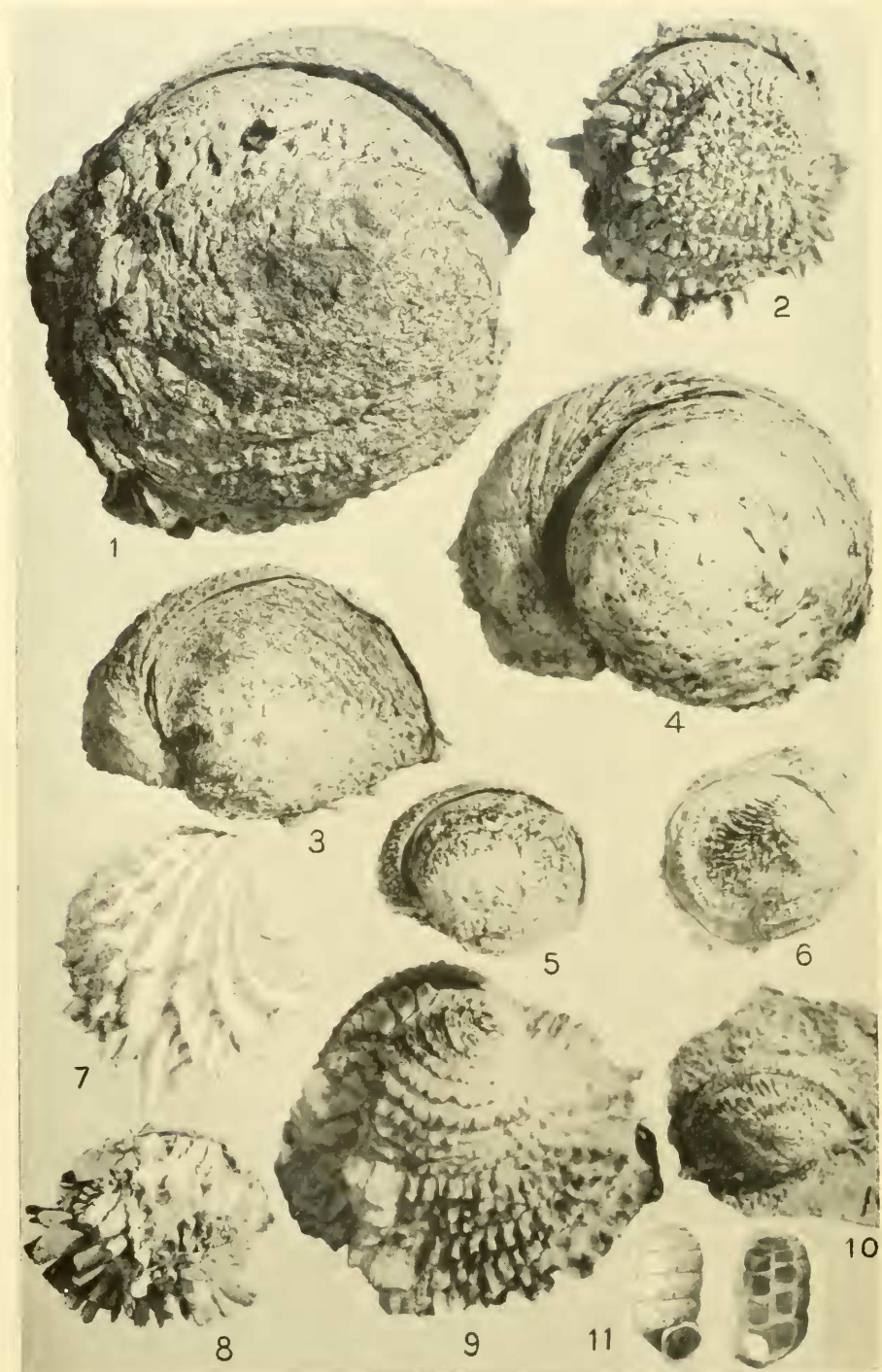
Although Lamarck had divided the Chamas into those with the beaks turning from right to left (attached by left valve, "regular" chamas), and those with beaks turning from left to right (attached by right valve, "inverse" chamas), this distinction was disregarded by later authors, who, even up to the time of Dall, thought that the same species could attach by either valve. This question has been investigated thoroughly by Odhner, who by a study of the anatomy of both regular and "inverse" chamas, the protoconchs, and the hinge teeth of very young stages, has shown conclusively that two strongly distinct stocks are involved. To the "inverse chamas" he gave the generic name *Pseudochama*.

Chama sarda Reeve has been reported from the Florida Keys by Dall, Johnson and Smith. We do not know exactly what shells these authors had, but we have not seen any Chamas referable to *sarda* from Florida, though there seems no reason why it should not occur there. It occurs in the West Indies and on Central American coasts. Probably *C. sarda* is not separable from the West Indian *C. florida* Lam.

Chama lactuca Dall, 1886, reported by Dall from North Carolina to Barbados in 63-100 fathoms, appears from its smooth internal margins and other characters to stand near *C. sinuosa* Brod. It is sculptured with radiating and concentric series of very small, short spines, each grooved underneath. It has not been figured and we have not seen specimens.

Key to shallow water Chamas of Florida

1. Shell nearly equivalve, the valves strongly convex with a large lunule, and sculpture of erect tubular spines on radial ribs *Echinochama arcinella*.
- Valves strongly unequal, the attached one larger; no lunule. 2.



FIGS. 1-10, Florida Chamididae. 11, *Urocoptis marwelli* Pils.

2. Apices of valves turning from right to left; attached by left valve (*Chama*) 3.
Apices turning from left to right; attached by right valve (*Pseudochama*) *Pseudochama radians variegata*.
3. Inner border of valves crenulated; pallial line passing around end of anterior adductor scar, joining at outer (anterior) margin of the scar 4.
Inner border of valves smooth; pallial line joined to lower extremity of anterior adductor scar, *Chama sinuosa firma*.
4. Larger; sculpture of profuse foliations, *Chama macerophylla*.
Smaller; sculpture of fine radial corrugations, with or without short foliations on concentric ridges *Chama congregata*.

CHAMA MACEROPHYLLA Gmel. Pl. 7, figs. 2 (Key West), 8 (Boynton).

This is the commonest West Indian species, known by its copious foliation, the crenulate internal border, and by having the pallial line run to the outer (anterior) limit of the anterior adductor scar. The color is various, reddish brown or dull purplish hues, yellow or white. Some specimens from exposed places have the foliation much reduced. Very handsome lemon-chrome to mustard yellow shells were taken opposite the first groin south of Boynton Inlet, east Florida, the interior white and yellow, or white and liver brown or hessian brown. Length 40 to 55 mm., rarely to about 65 mm. In the West Indies it grows larger, length 65-70 mm., or even up to 90 mm. At Boynton it seems to prefer deeper water than *C. sinuosa firma*, about 3 to 10 feet.

CHAMA CONGREGATA Conrad. Pl. 7, figs. 6 (Boynton), 10 (Sanibel).

A rather small chama, not often over 36 mm. in greatest dimension, related to *C. macerophylla* by the crenulate inner margins and the pallial line aligned with the anterior outline of the anterior adductor impression; but it differs in external sculpture. Typically there are rather low concentric ridges on the free valve, often with short laminae posteriorly, and crossed by a fine radial corrugation. There is often, but not always, a shallow furrow from beak to posterior-basal extremity. In its finest development, when the point of attachment is small, the attached valve is strongly convex with spiral umbo and sculpture like the free valve, but with fewer, more prominent and rougher concentric sculpture and similar fine radial corrugation, or the latter may

be obsolete. Interior white, or with more or less purplish-brown stain.

When growing attached to a flat surface the lower valve has the usual triangular section. The fine corrugations of the liver-brown surface are often hardly interrupted by concentric ridges or foliations. A specimen from Boynton is figured, fig. 6. They appear to prefer to live under stones and in crevices.

A small form of *C. congregata* is common growing on *Atrina rigida* (Dillw.), on the Gulf side of Sanibel Island; also occasionally found on arks or other shells. The usual size is 16 to 22 mm. long. They are reddish brown of various shades, radially corrugated, with but little trace of concentric sculpture. The broadly attached left valve is rather shallow, the free valve flattened posteriorly, or with a shallow sulcus from beak to posterior-basal extremity (fig. 10).

CHAMA SINUOSA Brod. Pl. 7, fig. 9.

The shell is only moderately thick, whitish, uniform or marked with tawny, suffused or concentrated on the foliations. Sculpture of many concentric ruffles of hood-shaped scales. Fixed valve more coarsely and irregularly flounced and foliated than the free valve, the attachment small. A rather deep open furrow runs from beak to posterior-basal extremity. It is distinguishable from *macerophylla* at once by the entire *absence of crenulation* of the inner margins of the valves. The pallial line runs into the lower extremity of the anterior adductor scar at about the middle (not running past the end as in *macerophylla*). West Indies.

Nothing like typical *C. sinuosa* is yet known to us from Florida, but the following form is apparently not specifically separable.

CHAMA SINUOSA FIRMA n. subsp. Pl. 7, fig. 1.

The shell is very much thicker than *sinuosa*, with far heavier teeth. The external color is dirty whitish, but on shells "cleaned" with acid there are some inconspicuous rusty brown flecks. Sculpture is largely effaced, but consisting of irregular, coarse concentric laminae more prominent posteriorly, with sometimes a little radial corrugation in places. There is a small furrow from beaks to posterior basal end, much less emphatic than that of *C. sinuosa*. Interior white with more or less green suffusion, and often a touch of liver brown at the lower edge. All of the specimens

were attached to coquina rock by the whole lower surface of the left valve. Greatest diam. 70, least 59 mm., to 84 × 66 mm.

Beach opposite 1st groin south of Boynton Inlet (of Lake Worth), Palm Beach Co., Florida. Type 168432 ANSP., paratypes in McGinty collection. The specimens were taken in about 3 to 5 ft. depth. They are much alike, since all found were seated on rock. At that depth any young settling on stones or shells would be carried away by the waves. The full characters and significance of this form will be revealed when they are fished from below wave action where they can attach to small objects. At all events, they differ from *C. sinuosa* so much in appearance that a special name seems convenient, either as a race or only an ecologic *forma*. The name *firma* alludes to the strength of the shell.

C. s. firma and *P. r. variegata* prefer the main reef of very large, flat rocks. This reef is covered with a heavy growth of moss-like algae, in which only fairly large shells can be seen. This accounts for the absence of young ones in the lots collected.

C. sinuosa bermudensis Heilprin, 1889, has a strongly spiral left valve, both valves are more deeply cupped, and of a dirty cream-buff tint inside. It seems to have laid on the bottom unattached, and as all the specimens have a very heavy calcareous algal incrustation, the sculpture is not visible.

PSEUDOCHAMA RADIANS (Lam.).

A rounded species, typically whitish with a broad ochraceous-tawny or cinnamon ray, often divided, down the posterior slope, but sometimes this is absent, or the color may be more diffused over the valve. Typically there is little sculpture, but usually some traces of two series of flattened foliations are seen on the posterior slope, and sometimes they are rather well developed, with also some irregular foliations anteriorly. Such specimens lead to *C. ferruginea* Rve., which appears, as Odhner noted, to be merely a strongly foliated form of Lamarek's species. The internal margin is more or less crenulated. Both *radians* and the form *ferruginea* are West Indian.

In the Florida form, which we are calling PSEUDOCHAMA RADIANS VARIEGATA (Rve.),¹ pl. 7, figs. 3, 4, 5, the shell is covered with

¹ Originally described from Honduras.